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HOW TO TEACH AGRICULTURE

BY THE AUTHORS OF
"AGRICULTURE FOR BEGINNERS"

REVISED

GINN AND COMPANY
BOSTON · NEW YORK · CHICAGO · LONDON



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HOW TO TEACH AGRICULTURE

GENERAL CONSIDERATIONS

A child is educated for two reasons : first, that he may *know* — know widely, accurately, systematically ; second, that he may *do* — do intelligently, honestly, and efficiently. This being true, it follows that from an educational point of view agriculture is one of the most useful sciences. It offers in a preëminent way a wide field for accurate, interesting, uplifting knowledge — a knowledge of the relationship and adjustment of all the forces of nature ; and at the same time it offers a wide field for doing. This latter field is healthful, honorable, lucrative, and independent.

Agriculture is therefore both a cultural and a practical study. It is cultural because it is concerned with the highest truths that the mind can consider ; namely, the laws of life, of growth, of heredity, of adaptation, of selection, of environment. It deals with the greatest objects in nature ; namely, the ground, the waters, the forests, the crops by which all life is supported, the animals that cover the earth. It views all these objects in relation to universal laws and shows their interdependence.

In the next place agriculture is the most practical of sciences. The knowledge acquired from it can at once be applied to life. It is also practical in that it shows the relation between cause and effect. It is not sufficient that a man should know that clover increases the fertility of land. He should know how it does this, just as he knows how interest is computed. It is not enough for a man to be told that good plowing makes better crops. He should know why it does this, just as

he knows how his multiplication table is made. Both as an intelligent and as a practical being he is interested in knowing how bacteria cause milk to sour, how germs assist in cream-making and in butter-making, why ashes are helpful to plants, why drainage is good for the soil, and countless other things that are as easily taught as the facts of arithmetic and of geography and that are far more interesting and useful.

WHAT TO TEACH AND WHAT NOT TO TEACH

In agriculture, of all studies, the teacher should aim to teach not so much the *how* as the *why* of things, in order that a knowledge of the *why* may cause the *how* to be the more intelligently done.

The teacher, therefore, need not undertake to show the pupil how to plow but rather to show him from the text what is to be gained from the right kind of plowing. The pupil, having acquired this information, will plow aright when he comes to plow, for he will understand the aims and results of good tillage.

In like manner the teacher is not expected to have milk cans at the schoolhouse in order to show pupils how to scald and sun them. However, if the pupil is taught that dirty cans harbor germs and that these germs spoil the milk and also carry disease, he will attend to his milk cans when he goes into business for himself, and by having better milk he will succeed better.

The teacher cannot, of course, always have an orchard in which to show how to prune and spray fruit, but by following the text the teacher can show how spraying and proper pruning improve the fruit, and can also take a walk with the pupils and show them some orchard that is properly cared for. Then when these pupils have orchards of their own they will find ways and means to apply their knowledge.

In short, teaching the simple truths that lie at the very door of successful farming and of good living is all that is expected of the teacher. These truths are all set forth in the text-book.

Remember that the acquisition of a large number of facts does not make a successful man or woman. The facility given by study, the power of thought, the turning of fresh minds to primary truths, the bent in the right direction — these are the things that give people a grasp that leads to able doing. Any earnest teacher can give this primary push.

THE TEACHER'S ATTITUDE TOWARDS AGRICULTURE

Do not think that you have to know all agriculture to teach some. Your aim is not to teach girls and boys to be model farmers; that will come of itself if you turn their young minds to a first-hand study of agricultural truths. If you arouse their interest in the plants around them, if you awaken their sympathy and love for animals, if you teach them the simple and beautiful laws of nature that control the growth of both plants and animals, your work is done, and a grand work it is. You need not fear the result. Your pupils will love the country and will rarely consider leaving the farm. They will be happy, intelligent, and prosperous farmers and housewives. Their homes will be centers of refinement and comfort.

When you approach this subject bear in mind the following points:

1. Have confidence in yourself and in your subject. The subject is worthy, so approach it with earnestness and a determination to make it an agent for uplifting and beautifying country and home life.

2. Teach agriculture as you would any other subject. See that each pupil has a book. Assign a lesson, see that the pupils study it at home and in school, and make sure by questioning during the recitation hour that they have learned the cardinal facts of the lesson.

3. Do not of course waste the time of the pupils by requiring them to memorize the words of the book. See to it that the pupil has mastered the lesson well enough to give it in his own

words. His answers should smack of his own individuality. Try to lead each pupil to study this lesson with an eye on the book and an eye also on the field that he passes, on the insect that he hears, and on the plant that he sees.

4. Let some of your language lessons and composition subjects be drawn from your study of agriculture. This will quicken observational habits and make the work of composition easier. Pupils do not dread writing so much when they are fairly familiar with the subjects on which they are required to write. Your work in composition can, then, with advantage and comfort, be drawn from the practical subjects studied in agriculture. For instance, let the pupils write an account of one of the simple experiments performed in the schoolroom, or give an account of a walk taken with the teacher to some neighboring wood or farm, or a little story of how bees carry pollen from flower to flower, or the points of difference between a beef and a dairy cow. These everyday subjects will appeal to the children, and they will write with more satisfaction to themselves and with more confidence in their own powers than they usually do. Moreover, this practice will teach them to watch sharply in order that they may write with ease.

CLASS ORGANIZATION AND STUDY

1. If the school is ungraded, include in the class in agriculture all the boys and girls who are able to read the fourth reader. If the school is a graded one and has two or more teachers, let agriculture be taught in the fifth grade.

2. Encourage the members of the class to read the lesson at home with their parents. They will in this way get the benefit of the practical experience of their parents, and at the same time they will interest their parents in a more scientific study of farming.

3. Do not rely on an oral teaching of the lesson without books. A child's ears should be assisted by his eyes. He cannot do his best work without a definite study of a definite lesson.

TEACHING THE LESSON

1. Review the last lesson. The teacher can conduct this review by asking some pupil for a general summary of the last lesson or by asking special questions that cover the facts in the lesson. This review ought, of course, to be brief and ought to cover only the vital points.

2. After the review let the day's lesson be taken up earnestly and with the aid of any objects that may stimulate interest and awaken attention. These can be provided with very little trouble and no expense. One day you may use a handful of poor soil and a handful of good soil and point out some of the differences; another day a root, a flower seed, a diseased plant, a pestilential weed, an ear of seed corn, or any of a thousand and one objects that will suggest themselves from a study of the text may be used.

A SUGGESTED FORM FOR ONE LESSON

The following will suggest one way of teaching the lesson. Of course many other ways could be suggested, and original ways will suggest themselves to each teacher.

Suppose the lesson to begin at Section III, p. 9, "Agriculture for Beginners." The topic is The Moisture of the Soil.

Teacher. John, you may read the first paragraph.

John. "Did any one ever explain to you how important water is to the soil, or tell you why it is so important? Often, as you know, crops entirely fail because there is not enough water in the soil for the plants to drink. How necessary is it, then, that the soil be kept in the best possible condition to catch and hold enough water to carry the plant through dry, hot spells! Perhaps you are ready to ask, 'How does the mouthless plant drink its stored-up water?'"

Teacher. Grace, have you ever seen a time when crops were suffering for water?

Grace. I have seen the grass dry and brown and withered.

Teacher. A lack of water in the soil caused the grass to wither. Albert, you may read the second paragraph.

Albert. "The plant gets all its water through its roots. You have seen the tiny thread-like roots of a plant spreading all about in fine soil; they are down in the ground taking up plant food and water for the stalk and leaves above. The water, carrying plant food with it, rises in a simple but peculiar way through the roots and stems."

Teacher. Edith, which kind of plant holds most water, green or dry?

Edith. Green. Corn and hay become dry when cut and left in the sun. The water escapes into the atmosphere.

John. Hay becomes much lighter and easier to handle after drying. I know that from experience.

Teacher. Have you ever examined the roots of corn or cabbage or clover? Are they thread-like? Henry may answer.

Henry. They are. I have seen them spread all about in the fine soil.

Teacher. How many have ever examined the roots of a growing plant?

[Here some hands will doubtless go up, but many will not.]

Teacher. Every one of you should examine the roots of some plant. Suppose to-morrow each one of you brings to class a small plant. Dig the plant yourself and wash the soil from the roots.¹

Teacher. What do the roots do in the soil? George, you may answer.

George. They take up water and plant food.

Teacher. Anything else, George, that you can think of?

[George may or may not know. Open the question to the class. Some one may mention that roots keep the plant in place, that they loosen and open the soil, etc. These questions and answers cause the pupils to think and to seek more information for themselves.]

Teacher. Grace, will you read the next paragraph?

[Grace reads.]

Teacher. Thomas, what use does the plant make of the food which it takes through its roots?

¹ This will make an interesting object lesson for the next day. One plant will show a long tap root, another will show many branching roots, while others will show variations in form and growth. Teach the children to study these differences by themselves.

Thomas. Builds new tissue.

[Here the teacher may explain the idea of growth and enlargement. It will be interesting to the children to know how the food of an animal or plant goes to make the very sort of material needed in the body. An entertaining story can be furnished by this subject.]

Teacher. What becomes of the water when it reaches the leaves?
Edith may answer.

Edith. It passes from the leaves into the air.

Teacher. Henry, why do leaves shrink up?

Henry. The leaves do this in order to keep the water from passing too rapidly into the air.

Teacher. A rapid passage of water matters little when there is an abundance of it in the soil, but when the soil is hot and dry, this is nature's way of limiting the daily supply.

HOW TO HAVE PUPILS EXPLAIN PARTS OF LESSON

Try to train the pupils to be thorough in getting the meaning of the text. The teacher should drill them in giving, in their own words, a summary of a paragraph, of a topic, and of a lesson. Take the next paragraph of the same section, The Moisture of the Soil. The recitation may be carried on in the following manner :

Teacher. Charles, you may tell what means can be used to keep the soil in such a condition as to have a supply of water for very dry times.

Charles. Deep plowing will help ; subsoiling will be helpful, since it loosens the soil and thereby enables it to hold more water than a shallow soil can ; then, also, the addition of any kind of vegetable matter will help.

Teacher. George, can you add anything?

George. Cultivating the soil is also helpful.

Teacher. Does any one wish to ask Charles or George a question?

Margaret. Why does George say that cultivating the soil is helpful?

George. Because cultivation forms a dry, fine mulch of the top soil. This serves the same purpose that straw or a board would serve,

were either used to cover the soil. You know it is always moist under a board, no matter how hot and dry the weather is.

Margaret. Is that the reason the farmer cultivates his corn and cotton?

George. That is one of the reasons.

Teacher. What are other reasons?

Charles. To get rid of weeds.

Teacher. That is correct. Any other? Henry?

Henry. Cultivation also loosens the soil and makes it mellow and fine.

[The teacher may say a word about soil-making at this point, describing how soil is being made at all times and how important it is for the farmer to assist in the work at every opportunity. When this topic is exhausted, the teacher calls for the next topic by asking William to explain what the topic says.]

William. The soil takes in water and holds it. When the ground gets dry on top, the water rises as oil does in a lamp wick. People call this capillarity.

Teacher. Is there any question you wish to ask about this?

Mary. I don't clearly understand what "capillarity" means.

Teacher. The next paragraph will explain better, so we will pass on to it. Henry, you may read the next paragraph.

[Henry reads, and questions are asked by pupils and teacher; and so on to the end of the lesson.]

It often happens that one of the pupils asks a question which the teacher does not know how to answer. Let the teacher be perfectly frank and admit that he does not know. At the same time let him say that he will take pleasure in finding a satisfactory answer, and let him be particular to ask the class to join in a search for the desired answer. Both the coöperation and the confidence will be helpful.

The teacher should remember that we have hundreds of agricultural experiment stations and scientific laboratories where men and women are at work trying to find answers to agricultural questions. Don't be surprised or embarrassed if a great many questions are asked which you cannot answer. Who

can answer all the questions that a child can ask? The teacher can always write to the agricultural college and experiment station of his state for answers to difficult questions or he can ask some good farmer.

THERE SHOULD BE NO MEMORIZING

Do not ask pupils to memorize the text. Get them to answer questions and to make all explanations in their own words. Much harm has been done to children by compelling them to commit lessons to memory in order that they might receive perfect marks.

A pupil who tells in his own words the main part of a lesson, though minor parts are unuttered, has had more true mental drill than his classmate who memorizes the lesson, but who is likely to forget it in a short time. The latter learned to memorize but failed to learn how to think. Agriculture must train to right thinking.

WRITTEN WORK ABOUT THE LESSON

It will be desirable at times to vary the plan of recitation. Let the pupil try his descriptive power by writing parts of the lesson.

The teacher may say "After you have studied your lesson in agriculture to-day you may write for me, in your own words, an abstract of the lesson" (or, of a certain topic in the lesson).

The teacher may write on the blackboard a few topics as a guide. After some drill in this writing, however, the pupils will not need guidance.

Written work may include, also, short descriptive sketches of observation walks into surrounding country for the purpose of observing interesting agricultural features of the community: special crops, new feeds of animals, improved machinery, special methods of cultivation of crops, road making.

EXPERIMENTS

Experiments are a desirable feature of agricultural teaching. They serve

1. To stimulate interest.
2. To quicken observation.
3. To lead to new thought and to investigation.
4. To link old truths with new truths.

The teacher should bear in mind that his effort is not so much to help the pupil as it is to help the pupil to help himself. The secret of good teaching lies in following this cardinal principle.

Plan not to overdo the experiment side of teaching. You will not need an experiment for every day. An experiment each week, or as nearly once a week as is convenient, will be sufficient. You want the class to engage in this work. The teacher should help, but should let the members of the class prepare the material and conduct the experiments.

The teacher can, however, introduce new experiments when he finds one that appeals to him.

Here, for example, is one. The object of the experiment is to show how cultivation checks the evaporation of moisture from the soil. Take two lumps of loaf sugar. Place one lump on top of the other, on a saucer or on a plate. Slowly pour a little ink on the plate or in the saucer. The lower lump will quickly take up the ink by capillary attraction, and the whole lump will soon be saturated. The top lump will not get the ink until considerable time has elapsed, because the air spaces between the lumps check the upward flow.

Cultivation of the soil acts in the same way as the joint between the lumps. The cultivating tools break off the tops of the soil tubes that carry the water upwards, and the dry dust acts as a mulch, or blanket, to keep the water in the soil tubes.

TWO KINDS OF EXPERIMENTS

Not all experiments can or should be performed in school. The object of all experimentation is to stimulate the ambition of pupils to find out things and to do things for themselves. Therefore the teacher will recognize two kinds of experiments — the school experiment and the home and vacation experiment.

SOME SCHOOL EXPERIMENTS

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1. How Water rises in the Soil	14
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9. Germination of Seeds	75

SOME HOME EXPERIMENTS

1. Preparation and Treatment of the Soil	20
2. Seed Selection	65
3. Selecting Seed Corn	68
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THE PUPILS' PART

Let the pupils freely ask questions. We often learn more by asking questions than we do from the answers. It is an excellent plan to require pupils to make a list of questions

as a part of the preparation of the lesson. Let these questions include original interrogations as well as questions suggested by the book.

The teacher does not need to answer all the questions. Often the greatest good will result from letting the pupils find out the answers. The teacher may make a list of his own questions or a list from the questions asked by pupils or combine both.

These questions may be written on the blackboard or written by each pupil in his notebook. Considerable interest and profit will result from such questions.

REVIEW THE WORK FREQUENTLY

The teacher should be in no hurry to cover the text. Review frequently. In these reviews it is well, if possible, to present the lessons in a different form from that in which they were presented the first time. Hence if the teacher will use a few minutes each day in making out questions and stating the topics of the lesson, as is done in the following outlines, the synopsis will be very helpful. Such an outline gives in an easily remembered form the vital facts of the lesson.

CHAPTER I. THE SOIL

SECTION I. ORIGIN OF THE SOIL

What is the soil?

Difference between soil and subsoil.

How do heat and cold make soil?

[Explain how frost, ice, and water make soil. Have you seen the effect of each? Have your pupils? Lead the pupils to see, to think, and to tell what they have seen.]

What relation has rock to soil?

Examine different kinds of soil.

SECTION II. TILLAGE OF THE SOIL

What made Jethro Tull famous?
What lesson has he taught us?
What tools are needed for tillage?
The air as a soil-maker.
What good tillage does.
How to make the soil deep and productive.

SECTION III. THE MOISTURE OF THE SOIL

The plant needs water.
Water and plant food.
How dry weather affects plants.
Ways of holding water in the soil.
Capillarity of water in the soil.
Keeping water in the soil.
What cultivation does.

SECTION IV. HOW THE WATER RISES IN THE SOIL

Soil dry on top.
Soil moist below the surface.
How water rises.
Experiment: To show the rise of water in the soil.

SECTION V. DRAINING THE SOIL

Drainage a valuable improvement.
Benefit from draining the soil.
Tile drains.
Superiority of tile drainage.
Experiments:
1. To show effect of drainage.
2. To show effect of air in soil.

SECTION VI. IMPROVING THE SOIL

Virgin soils.
How to reclaim old soils.
What tillage does.

The value of humus.

How to add humus.

Experiment: To show good and poor preparation of soil.

SECTION VII. MANURING THE SOIL

The first use of fertilizers in America.

The way to ruin the soil.

The way to build the soil.

The forms of nitrogen in fertilizers.

The forms of phosphorus.

The forms of potassium.

CHAPTER II. THE SOIL AND THE PLANT

SECTION VIII. ROOTS

Do roots branch regularly, as do twigs?

How deep do the roots of corn plants extend into the soil?

Examine the root hairs of seeds planted in the germinator.

Why does a plant wither when it is cut from its roots?

How does a knowledge of the length of roots affect tillage?

Examine plants in the field and find which are deep-rooted and which are shallow-rooted.

SECTION IX. HOW THE PLANT FEEDS FROM THE SOIL

Food must be in a soluble condition in order to be used by a plant.

Work out carefully the experiment shown in Fig. 22.

SECTION X. ROOT-TUBERCLES

What is a root-tubercle?

The plants they grow on.

Where they live.

Their value to agriculture.

Experiment: To examine and study different kinds of root-tubercles.

SECTION XI. THE ROTATION OF CROPS

The reason for crop-rotation.

Not all crops use the same kind of food.

How to adjust crops to the land.

Making a plan for crop-rotation.

A help in soil improvement.

Make a plan for crop-rotation to suit individual conditions.

CHAPTER III. THE PLANT¹

SECTION XII. HOW A PLANT FEEDS FROM THE AIR

What is carbon?

Demonstrate the existence of carbon in paper, wood, cloth, and hay by burning them.

Is a large or a small portion of a plant made of carbon?

Where does this carbon come from?

Is there much carbon in the air?

Why is the supply inexhaustible?

What two things are necessary in order that the plant may get its carbon from the air?

Into what is carbon made, and how are these substances stored in the plants?

SECTION XIII. THE SAP CURRENT

In what direction does the sap move through the wood? through the bark?

How does an injury to the leaves cause injury to the roots?

In what way does girdling affect trees? Do not neglect to have your pupils make the experiment suggested in the exercise accompanying this section.

¹ Farmers' Bulletin, No. 586. "Collection and Preservation of Plant Materials for Use in the Study of Agriculture." This bulletin will be found helpful and suggestive. Address United States Department of Agriculture, Washington, D.C. It will be sent free.

SECTION XIV. THE FLOWER AND THE SEED

What is the object of a flower?

Do all plants which bear seeds have flowers?

[Examine the blossom of the elm in early spring; also bring into your class large blossoms from various kinds of plants, and have your pupils locate and recognize the different parts and learn to know them by name. Show them particularly, if possible, blossoms of the cucumber, squash, and watermelon. Examine the blossoms of some plant near the schoolhouse while they are still unopened and in a very young condition. Try to watch them day by day to see how fast they open and how fast the fruit ripens. Some plant which has a fairly large fruit will be especially favorable for this study.]

SECTION XV. POLLINATION

Examine many plants to see what the method of pollination is.

Which of our food plants are pollinated by bees? Which by the flies? Which by the wind?

See if you can find, in the blossom, the nectar which the bee is after. Cover some flowers with paper bags before they open, to prevent the visit of insects, and note whether such blossoms mature seeds or not. See if you can get an answer by observation to the various questions asked in the exercise. [Have your children observe closely a visit of the bees to the blossoms, noting in such instances a bee thoroughly dusted with pollen.]

CHAPTER V. HORTICULTURE

SECTIONS XXV, XXVI. MARKET GARDENING, AND
FLOWER GARDENING

What is included in the art of horticulture?

What does the landscape gardener seek to produce?

What home grounds in your community are best kept and seem to be an example of good landscaping?

What aids has the market gardener employed in cold climates?

Give four rules to guide one in the care and cultivation of garden crops.

- What general rule should be followed in planting home grounds?
- Name three plants that may be grown from cuttings.
- What is the difference between a bulb and a corm?
- How may the vigor and blooming power of a flowering plant be prolonged?
- What are annuals?
- Name six common annuals of your neighborhood.
- What are the common perennials of your neighborhood?

CHAPTER VIII. FARM CROPS

SECTION XXXV. COTTON

- Importance of the cotton plant.
- Kinds of soil for cotton.
- The climate for cotton.
- Increased acreage and importance of cotton.
- Varieties of cotton.
- Improvement of cotton.
- Methods of culture and production.
- The demands which cotton makes on the soil.
- Relation of live stock to cotton crop.
- The teacher* may point out the relation of cotton to industrial progress; also its place in history.

SECTION XXXVI. TOBACCO

- An important crop in our early history.
- Where tobacco grows.
- Choice of soil.
- Keeping the tobacco soil fertile.
- The story of growth.
- Making the seed bed.
- Transplanting.
- Culture.
- Harvesting.
- Varieties.
- [In connection with the study of this crop let the teacher explain its importance in our early history, when it was used as money.]

SECTION XXXVII. WHEAT

An ancient crop.

Wheat soil.

The seed bed.

Planting and fertilizing.

Varieties of wheat.

Exercise: Small and large heads of wheat.

[The teacher can refer his geography class to this crop.]

In what parts of the world is wheat grown to-day?

What are the leading wheat countries?

The opening of the great West and the wheat industry.

The four centers of the world.

CHAPTER X. DOMESTIC ANIMALS

SECTION LVI. SWINE

Where swine came from.

Much profit in raising hogs.

Breeds of swine.

Cleanliness of swine houses and troughs.

SECTION LVII. FARM POULTRY

Classes of farm poultry.

Importance of the industry.

Kinds of fowl.

Care of poultry.

[The teacher will find this a good subject for composition.]

SECTION LVIII. BEE CULTURE

Breed selection.

Common breeds.

Character of each breed.

Pasture crops.

Habits of the bee.

Enemies of the bee.

SECTION LIX. WHY WE FEED ANIMALS

The uses of food.
Substance in food.
Classes of food stuff.
Compounding of foods.

CHAPTER XI. FARM DAIRYING

SECTION LX. THE DAIRY COW

Feeding the dairy cow.
Care of the cow.

SECTION LXI. MILK, CREAM, CHURNING, AND BUTTER

Care of milk, cream, and butter.
The need of cleanliness.
Relation of milk to disease.

[The teacher will do much good by dwelling on this section. Milk is a universal food. Thousands of children die annually because of unclean or poor milk.]

SECTION LXII. HOW MILK SOURS

Cause of souring.
Methods of delaying souring.
Precautions in cleansing utensils.
Precautions during milking.
Influence of the germ in cheese-making and butter-making.

AN OBSERVATION WALK

It will be well occasionally to take your pupils for a walk in the neighborhood of your schoolhouse. There are always many things of interest to be seen by the pupils, and many a point of your lessons in agriculture can be enforced by an observation lesson in the field. Then, too, there is a feeling of good fellowship and confidence established between teacher and pupil by this out-of-door comradeship.

WHOM TO TAKE

In deciding whom to take you should consider the nature, purpose, and length of the walk. If it is to be a short walk, take your whole school. If it is to be a long walk for the special purpose of visiting some distant field, farm, meadow, or forest, take only those who are strong enough for the trip and who are interested in the objects to be seen. In general, there are walks of three kinds:

1. Short walks of general interest. Invite the whole school to go on these.
2. Walks of a more strictly agricultural nature. On these it will be best to take only your pupils in agriculture.
3. A combination of the two. You will, of course, take the whole school on these combination walks.

WHEN TO GO

Some of the walks may be taken immediately after school, some at the noon hour. In other cases you should take fifteen, thirty, or forty-five minutes of your regular school time for this purpose; or you may go during the closing minutes of the noon hour or recess and return fifteen or thirty minutes after the usual assembling time; or, again, you may dismiss school fifteen or thirty minutes earlier than usual and continue your walk as long as you deem wise. It should be made clear to the pupils that the walk is not a frolic or a recess, but that they are really to learn something.

WHAT TO LOOK FOR

Let anything of interest claim your attention—a hibernating insect, an egg-laying butterfly, a leaf-gnawing worm or bug. It will always be well for you to go over the ground in advance of your class and find some of the chief objects of interest. Keep all the children busy. If, for the moment, there be nothing

of special interest, ask them to search for injurious insects, wild flowers, weeds in seed; to note the leaves of various kinds of trees, the bark of trees, the cries and flight of various birds, etc. Let each walk also have some special object; as, for example, the observation of the number of kinds of weeds to be found in the region traversed. As you walk you may also call the children's attention to any agricultural object lesson in sight. Ask such questions as these: "Is this field cultivated too deeply or not deeply enough? Why? Which of these cotton plants is the better? Which would furnish the best seed for next year's crop? Are there any corn plants with no ears in this field? any with one ear? any with two ears? any with three ears? Which plant bears the most corn? Which will produce the best seed corn? What is the name of that weed over there? How many names can each give for it? Which do you think is the best name? Is it a bad weed? Why? Where does it grow? How long does it live? What kind of seeds has it? How does it spread? Does it make many seeds? Let us send a good specimen of it to our experiment station and find out what its real name is. Let us also gather seeds and plants, and put both in our school collection.

Yes (in answer to a question), that is a cocoon. Bring it with you, and we will put it in our breeding cage in the schoolroom and see what kind of moth will come from it. Is that cow fitted for making beef or milk? Why? Do any of you know what such a cow would cost? How much milk will she give daily? Is she a Jersey? How do you know? What is the matter with this apple? When did the worm get into it? What will become of the worm? Could this kind of injury be prevented?"

AFTER-USE OF THE WALK

"Our Walk" should be made the topic of an essay or composition on the following day, or you may have a blackboard exercise by asking volunteers to tell what they learned or saw, and listing the items until you have thus secured an inventory

of the mental accessions of the whole class. Make it a practice to fix the knowledge gained in a walk by some kind of a review on the following day or on your return to the school.

FINAL WORD TO THE TEACHER

No matter how limited your instruction in agriculture may be, if it sets your pupils to thinking about the subject, if it starts them to reading about the business they are to follow, if it introduces them to plant and animal life for culture only, if it prepares them to be experimenters, if it makes them acquainted with the literature of farming — you have made their lives. This great power is in your hands. Who shall hinder you from using it?

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